

CLAIMS

What is claimed is:

- 1 1. A method of providing vascular therapy to a human or veterinary patient who
2 is in cardiac failure resulting in subnormal cardiac output, said method
3 comprising the steps of:
4 a) cooling the patient's heart to a temperature that is at least 1°C below
5 normothermia; and,
6 b) maintaining the temperature of the patient's heart at least 1°C below
7 normothermia for a sufficient period of time to provide improved cardiac
8 output.

- 1 2. The method of claim 1 wherein steps a) and b) are carried out at least in part
2 by i) inserting a cooling catheter into the patient's vasculature, said cooling
3 catheter having a heat exchange region and a core, said heat exchange
4 region thermally coupled to said core, the cooling catheter being positioned
5 within the patient's vasculature such that the heat exchange region is
6 positioned in the lumen of a blood vessel, the inner diameter of the blood
7 vessel lumen being larger than the outer diameter of said heat exchange
8 region, and ii) exchanging heat between blood flowing past said heat
9 exchange region and said heat exchange region for sufficient time to cool the
10 patient's heart tissue to a temperature at least 1°C less than normothermia.

- 1 3. The method of claim 2 wherein the cooling catheter is positioned such
2 that its heat exchange region is in the inferior vena cava of the patient.

- 1 4. The method of claim 2 wherein said core comprises flowing heat
2 exchange fluid.
- 1 5. The method of claim 2 wherein steps a and b are carried out by
2 circulating heat exchange fluid through an external heat exchanger to alter
3 or maintain the temperature of said heat exchange fluid and through the
4 catheter core to exchange heat between the heat exchange fluid and the
5 patient's circulating blood.
- 1 6. The method of claim 1 wherein the patient's heart is cooled to a
2 temperature below 35.5°C.
- 1 7. The method of claim 6 wherein an anti-shivering treatment is
2 administered to prevent the patient from shivering.
- 1 8. The method of claim 7 wherein the anti-shivering treatment includes
2 one or more of the anit-shivering mechanisms selected from the group
3 consisting of:
4 a) a warming blanket;
5 b) busparone;
6 c) meperidine; and
7 d) dexmedetomidine.
- 1 9. The method of claim 1 wherein the patient's heart is cooled for a period
2 of at least 3 hours.

1 10. The method of claim 1 wherein hypothermia is induced using one or
2 more methods selected from the group consisting of:

3 a) endovascular cooling;

4 b) esophageal cooling;

5 c) gastric cooling;

6 d) surface cooling; and

7 e) cooling with a cooling tent.

1 11. The method of claim 1 further comprising the step of:

2 c) placing a temperature probe in or on the patient to sense the temperature
3 of part of a patient and to generate a temperature signal based on said
4 sensed temperature, and controlling the patient temperature based on said
5 temperature signal.

1 12. The method of claim 11 wherein a temperature probe is placed at one
2 or more locations selected from the group consisting of:

3 on or in the heart;

4 on or in a muscle;

5 on or in a thigh;

6 in the esophagus;

7 upon or near the tympanic membrane;

8 on or near the skin;

9 within the bladder;

10 in the rectum; and,

1 within the vasculature in contact with the patient's blood .

1 13. The method of claim 1 wherein, prior to performance of steps a) and b), the
2 patient is diagnosed as suffering from cardiac failure based on at least one
3 indicia of cardiac failure selected from the group consisting of:

4 a) cardiac output below 2.5 liters per minute;

5 b) stroke volume below 25 cc;

6 c) ejection fraction below 40%;

7 d) echocardiographic findings;

8 e) physical examination findings;

9 f) cardiomegally;

10 g) increased left ventricular wall thickness and chamber dilation;

11 h) pulmonary edema;

12 i) angiographic findings;

13 j) findings on cardiopulmonary exercise testing; and

14 k) diagnostic tests of blood components.

1 14. The method of claim 1 wherein the method is performed to stabilize the
2 patient's condition prior to performance of an interventional medical
3 procedure or surgery.

1 15. A method of treating congestive heart failure in a human or veterinary
2 patients comprising the steps of:

3 a) providing a heat exchange catheter having a shaft, a heat exchange

1 surface, an inlet lumen and an outlet lumen;

2 b) placing said heat exchange catheter in the blood stream of the patient ;

3 c) circulating said heat exchange fluid at a temperature below normothermia
4 through the inlet lumen to cool the heat exchange surface , and then out
5 of the outlet lumen for a period of time sufficient to induce hypothermia in
6 said patient such that said patient's heart is 36°C or cooler; and

7 d) maintaining the patient's heart at a temperature at or below 36°C for at
8 least ½ hour.